

# Common CD-Player/CD-ROM Problems and Cures

**L**AST TIME, WE DID SOME GENERAL MAINTENANCE TASKS SUCH AS CLEANING AND LUBRICATION. IN MANY CASES, THAT MIGHT BE ENOUGH TO RESTORE YOUR PLAYER OR DRIVE TO NORMAL OPERATION. THIS MONTH, WE'LL TURN OUR ATTENTION

to what to do when such general maintenance is not enough.

## CD Player is Dead as a Brick

If the heading above more-or-less summarizes the state of your unit, the first step is to check the obvious. Make sure the input power cord is plugged in and good, inspect the fuse (if present), and verify that the power switch (if present) is functioning normally. Also make sure that the outlet to which your unit is connected is indeed supplying power and/or that the batteries are good.

After that, you must turn your attention to the power-supply components. Locate the outputs of the power transformer and trace them to the rectifiers and associated filter capacitors and regulators. While the actual voltages will probably not be marked, most of the power in a CD player will be within  $\pm 15$  VDC. The voltage ratings of the filter capacitors and regulators, if you can read them, will provide clues as to the correct power-supply voltages.

Most component CD players use linear power supplies so troubleshooting is straightforward even without a schematic. For reference, the power-supply schematic for a Technics SLP-310 is shown in Fig. 1. That unit is typical of those that use either discrete pass transistors (as in this case) or common IC regulators like the 7805, 7815, 7915, and similar devices.

Portable CD players and CD-ROM

drives often use DC-DC converters to produce the various voltages required, and those are much more difficult to troubleshoot, even with a complete service manual. Doing anything other than checking for shorted or open components is virtually impossible without an accurate schematic.

## Power-Adapter Blues

When it comes to portables, one of the common causes of damage is the use of an incorrect power adapter. When it comes to CD-ROM drives, connecting or disconnecting the power lead while power is being supplied is also a definite no-no. In either case, major damage can result despite the various types of protective measures taken in the design.

If that is the cause of the malfunction in the unit you are attempting to repair, all might be lost. Even so, check for the obvious—a blown fuse on the main board near the power connector—before giving up. These may be *pico*fuses, which look like little green resistors; IC Protectors, which look like tiny transistors with only 2 legs; or something else marked F, ICP, etc. Who knows? You might get lucky.

Then again, you might not. For example, I once inherited a Sony Discman from a guy who thought he would save a few bucks and make an adapter cord to use it in his car. Not only was the 12–15 volts from the car battery too high, but he got the polarity backwards! He blew the

DC-DC converter transistor in two, despite the built-in reverse-voltage protection, and he fried the microcontroller. Needless to say, the player was a total loss, except for some of the mechanical parts, which I salvaged for future use.

The moral of this story is that the voltage, current, and polarity ratings marked on portable equipment are there for a reason. Voltage ratings should not be exceeded. Using a slightly lower-voltage converter will probably cause no harm, though performance could suffer. The current rating of the adapter should be at least equal to the printed rating of the equipment you intend to power. Polarity, of course, must be correct. If you are not 100% certain of your adapter's output polarity, double check it with a voltmeter before plugging it in.

Keep in mind that some identically marked adapters deliver widely different open-circuit voltages. If the unloaded voltage reading is more than 25% to 30% higher than the marked value, be cautious about using the adapter. If the player acts in any strange or unexpected way with a new adapter, if any part gets unusually warm, or if there is any unusual odor, unplug it immediately and attempt to identify the cause of the problem.

## Unit Works, But No Display

Sometimes the display is backlit by miniature incandescent lamps. After a while, these burn out. If you take some time, you can probably find an inexpensive alternative to the high-priced exact replacements. Test any suspect lamps with your ohmmeter. Measure the voltage across the lamp terminals and then replace the lamp with one that is rated at a 25% to 50% higher voltage. They may not be as bright, but will last a long, long time.

If the lamps are not at fault, or if

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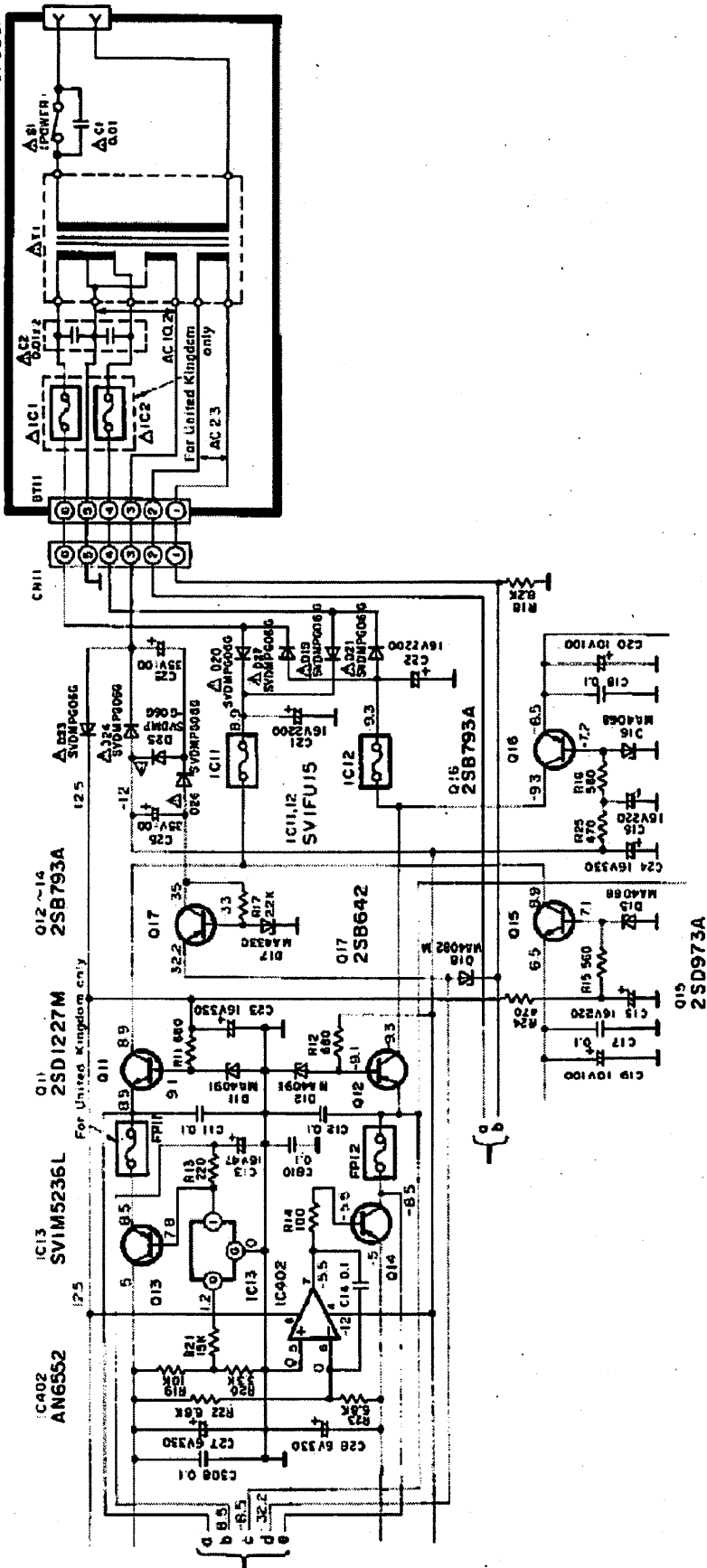


FIG. 1—MOST CD PLAYERS, like this Technics SLP-310, use a linear power supply, so troubleshooting is usually fairly straightforward.

there are no lamps, check for power to the display. At the same time look for bad connections or connectors that need to be re-seated. There might also be a power-supply or driver problem such as a missing voltage for a vacuum fluorescent display.

**CD Player Ignores You**

Symptoms here are that the display comes up normal when power is turned on, but all, or some commands are ignored. There are several possible causes:

- Front-panel problem: If one or more buttons are not responding, try to re-seat the internal cables. Clean or replace the offending switch or switches. If the player has a remote control, see if it is operating correctly.
- Reset failure: If the player has failed to reset properly and is not ready for user input, check the power-supply voltages and re-seat internal connectors.
- Controller and/or driver electronics: These could be defective for the affected functions. Once again, check the power-supply voltages and re-seat the internal connectors.

**Drawer Does Not Open or Close**

If the drawer does not open when the front-panel button is pressed, listen for a motor whirring but nothing happens, check for an oily or loose belt, or another mechanical fault. You can clean the belt as a temporary repair, but replacement will be needed eventually. If there is no motor sound (listen carefully), the motor, control chip, or front-panel push-button could be bad. If the unit has a remote, see if it will open the door. If it does, check the pushbutton for that function on the unit first.

**Erratic Drawer Operation**

You are about to remove your favorite CD from the unit but the player beats you to it—it closes the drawer and starts to play the disc over again. Other symptoms are that the drawer reverses course halfway out, or the drawer motor continues to whirl even after the door is fully open or closed, and the front panel is then unresponsive.

These kinds of problems are usually caused by dirty contacts on the door-position sense switches. There are usually three sets of switch contacts associated with the drawer mechanism. If any of those get dirty, worn, or bent out of place, erratic door operation results.

Those sense switches are:

- **Drawer-closed sense switch.** Dirty contacts may result in the drawer motor continuing to whirl after the door closes and the front panel may then be unresponsive. Eventually, the door may open on its own.

- **Drawer-open sense switch:** Dirty contacts may result in the drawer motor continuing to run after the door opens and the front panel may then be unresponsive. Eventually, the door may close on its own.

- **Drawer-pushed sense switch.** Most CD players allow the user to start play by gently pushing on the drawer. That depresses a set of switch contacts. If these contacts are dirty, the drawer can decide to close on its own or to reverse direction in the middle of opening or closing.

The solution to all three of these problems is to locate the offending switches and clean their contacts. Those contacts are rarely protected from dust, dirt and grime. As a result, the problems outlined in this section are quite common.

### Drawer Does Not Close Completely

Believe it or not, this is a problem that might not be obvious at first glance. The drawer may appear to close, but a loose or oily belt can prevent the mechanism from completing the close cycle. The result can be erratic behavior, since the disc-clamping action is often controlled by the movement. This problem can manifest itself in different ways. Sometimes, the drawer simply opens again. Other times, less obvious problems—such as the disc not being recognized or tracking problems during play—are the result. Clean the belt first and see if there is any improvement; belt replacement will be needed eventually. Check for gummed up lubrication as well.

More obvious is the situation where the player goes through the motions of closing but stops short without further sounds. If that happens, a gear may have jumped a tooth or there may be some broken gear teeth. The result is that the mechanism is now incorrectly timed or

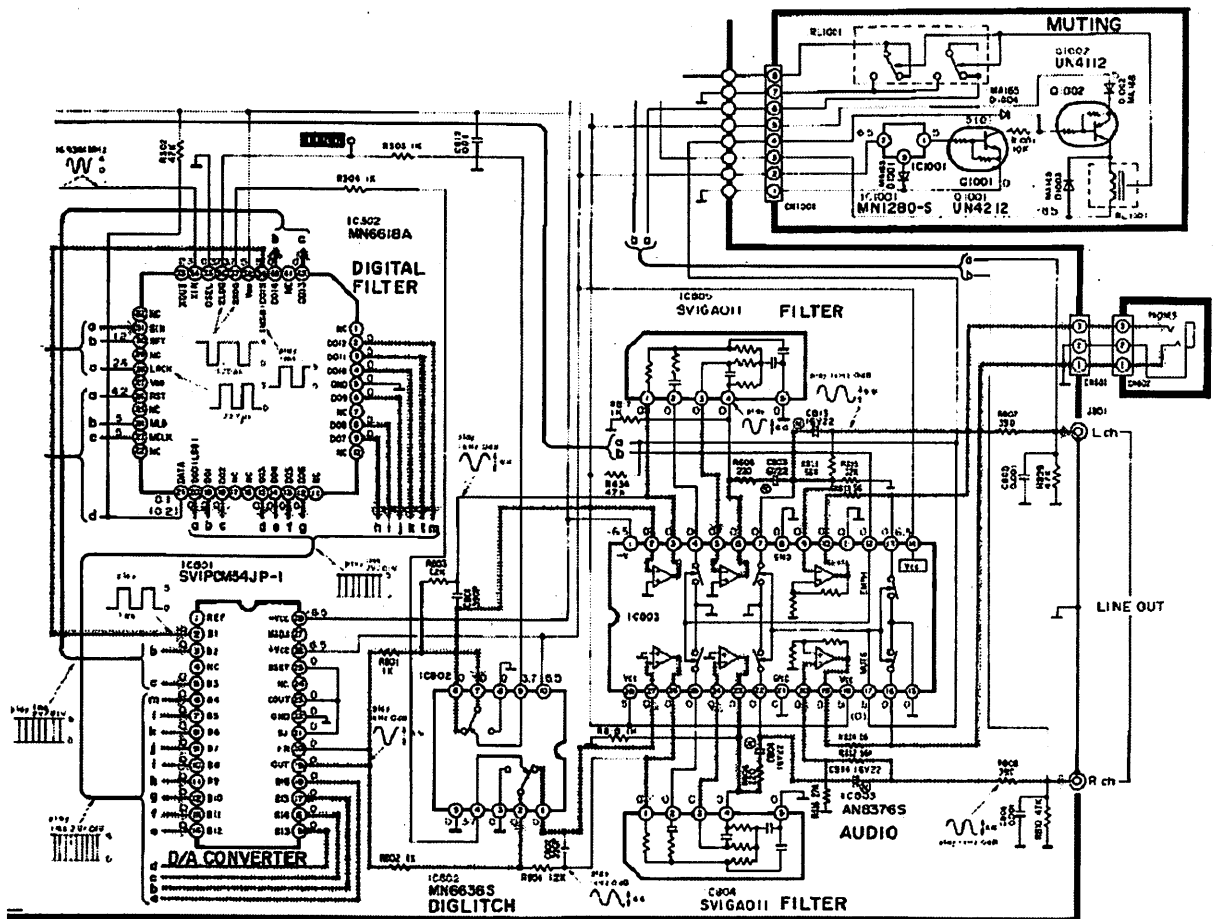
not able to complete the operation. Examine the mechanism closely for broken parts. Cycle it manually by turning the appropriate motor pulley or gear to see if the drawer gets hung up or is much more difficult to move at some specific point in the cycle.

If the motor continues to whirl after the drawer stops, there may be some other kind of mechanical damage that has caused an obstruction, or there is really gummed-up lubrication, not allowing the operation to complete.

### Loose Spindle Table

When you remove the CD, you may run into an added surprise—the platform that the disc sits upon pops off as well, possibly jamming everything. There may also be startup and spindown problems.

Different models use different techniques to fasten the spindle table to the motor shaft, but this is just about always a mechanical problem. Either a set screw has worked itself loose, adhesive has



**FIG. 2—THE AUDIO CIRCUITS** in a CD Player have both analog and digital sections. If the problem is in one of the digital LSI chips, there is little you can do. Dealing with the analog circuits is a bit easier.

weakened, or a press fit has come undone.

If there is a loose or missing set screw, get a new one or tighten the old one. If there is no set screw, a drop of epoxy cement may save the day. However, height is important to guarantee proper focus range, so be careful if there is no definite stop. The disc and rotating clamper magnet must both be clear of any fixed structures and be the correct distance from the optical pickup. Where something irreversible is involved, like using epoxy adhesive, checking the service manual becomes a must—the specification is usually 0.1 mm accuracy.

A loose spindle table can also cause continued spinning upon eject, or sluggish or noisy startup or seek; since if the spindle is loose, the motor cannot properly control disc speed during speed changes.

### Intermittent Operation

When a CD player appears to have a “mood” problem—playing fine sometimes or for only part of a disc, or aborting at random times—there are several possible causes. Those include a defective disc, a dirty lens, various mechanical problems, dirty or worn interlock or limit switch, bad connection to the interlock switch (mainly in portables and boomboxes), flex cable with hairline cracks in one or more conductors, other bad connections, missing optical deck ground/shield, or power-supply problems. Let's go through some of those:

- **Dirty, Scratched, or Defective CD:** It might be easy to overlook the obvious, so the first thing you should do is to confirm that the CD is not the problem. Clean the disc and/or try another one.

- **Dirty Lens:** A player that accepts some discs and not others, or accepts discs sporadically, may simply need its lens glass cleaned.

- **Mechanical Problems:** This usually involves oily and/or flabby belts preventing full drawer closing, or gummed-up lubrication on the sled (may fail depending upon ambient temperature). For example, if the music gets stuck at about the same time on every disc, then there may be gunk on the end of the sled track, preventing the sled from moving any further. That is especially likely to manifest itself if you just purchased a disc with an unusually long playing time. **NOTE:** Some players simply will not play discs that exceed about 74 minutes of playing time, the maximum CD playing time if the CD specification is followed. How-

ever, some discs may be as long as 78 minutes or more, which means that some aspects of the CD specifications were compromised.

- **Dirty Switches:** Oily film or oxidation may be preventing any one of the limit or interlock switches from making a reliable contact. If this is the problem, the player may stop at random times, fail to accept a disc, close the drawer without your permission, etc. Use contact cleaner and typing paper to clean the contacts. Disassembly may be required to get at the contacts of enclosed switches.

- **Cracks in Ribbon Cable:** The moving and fixed parts of the optical pickup are often joined with a printed flexible cable. Constant flexing may cause one or more of the copper traces to crack. This may show up as an inability to get past a certain point on every disc (the player might shut down or start skipping at about 23 minutes into every CD).

- **Bad Connections:** There are often many little connectors used to send signals and power between the optical deck and the main circuit board. These are usually cheaply made and prone to failure. Wiggling and re-seating those may cure your problems. There may even be bad solder connections on the pins of the connectors or board-mounted switches. Slight flexing or just expansion and contraction may result in intermittent shutdown or other problems. Note that this type of failure is most common in portables and boomboxes because they are more likely to take physical abuse.

- **Missing Shield:** A missing shield between the analog ground and the optical deck can result in all kinds of erratic behavior. If your intermittent problems started after you had the player apart for some reason, check that you replaced the grounding strap or metal strip and/or didn't accidentally disconnect or break any shield connection on the ribbon cable to the optical deck.

- **Power-Supply Problems:** Problems in the power supply could cause the types of intermittent problems listed above, but it is unlikely. That said, if you have an oscilloscope, it certainly does no harm to check the power-supply outputs for ripple—a filter capacitor may have dried up and lost most of its capacitance.

### Heat Problems

A CD player that becomes noisy, or a CD-ROM drive that fails to recognize discs or fails to reliably read data after a

few minutes of operation, may have a component that is heating up and changing value. There is not very much in a CD drive that runs hot; however, specific components do sometimes fail in this way. The way to diagnose and locate problems of this type is to use some of the same techniques that you would apply to finding overheating components in a TV or in a computer monitor.

Your main tool will be a can of cold spray (“circuit chiller” or, in a pinch, a hair dryer set to ‘no heat’), coupled with an oscilloscope (if one is available). What you are going to do is to try cooling various components to try to identify the one that is bad and causing the problem. However, if you are trying to deal with a unit that dies completely and suddenly after it heats up, this may not work very well since you may not have enough time to detect changes in behavior. If you are dealing with CD player that will play, but has tracking problems and/or audio noise, you should be able to monitor the playback quality by simply listening for improvement when you have cooled the flaky part. For a CD-ROM drive, play an audio disc if possible, since it will provide the feedback you need to locate the bad part without (hopefully) the drive shutting down due to data errors or inability to reliably access the file system.

Here's a good procedure to follow when making this test: First, run the unit with the covers removed and see if that has an effect that confirms a thermal problem. Next, use the cold spray on individual components. Start with a quick burst on an LSI chip and wait a few seconds for something to change. If nothing happens, move on to the next component. If you are using the hair dryer (no heat!), make a funnel out of paper to direct the air flow. Since this is not really cold air, expect to wait a bit longer to see any effect.

If you have a scope available, it would be wise to look at the RF “eye” pattern while cooling components and see if it changes in amplitude and/or quality over the course of an hour. If it does change, you may have an overheating problem in the laser diode or its power supply. (The “eye” pattern will be discussed in a future column, so you may want to hold off until then for this “advanced” troubleshooting!)

### Audio Problems

Silly me, what other kinds of problems are we talking about? What I should

have said: audio signal-chain problems. The player appears to be working fine (the disc is spinning; the time is incrementing correctly; seek, search, and play operations behave normally) but there is either silence, noise, or distortion on one or both channels.

Note: These sorts of audio symptoms could also be caused by problems with servo alignment, the optical pickup, or front-end electronics. Troubleshooting those types of problems will be covered in future columns. Therefore, if your problems are as outlined in the paragraph above, you might want to hold off on attempting to troubleshoot your unit until those topics are covered. Remember, patience is a virtue, and in this case can save you from wasting time troubleshooting a problem in one part of the player when its cause actually lies in another.

Getting back to the audio signal chain, there is a distinct boundary between the digital section where audio information is encoded digitally and the analog domain where it is an electrical waveform. The diagram of the audio circuitry of the Technics SLP-310 in Fig. 2 shows a typical organization. Note the separate circuitry for the D/A converter, digital filter, audio mute, and post analog filtering.

Problems in the digital domain will usually be obvious to the point of being gross—extreme noise, noise correlated with the signal level, extreme distortion, tones or frequencies that with no stretch of the imagination were present in the original music, etc.—and will be distinctly different than the kind of noise or audio distortion we are accustomed to in stereo equipment. Even small errors in the digital reconstruction can result in extreme changes in the audio output. For example, a single bit error if in the MSB can totally corrupt the resulting waveform. Simple errors can result in sound frequencies not present in the original. Fortunately, these sorts of errors are relatively rare as most of the circuitry is inside of very reliable LSI chipsets.

However, if the CD is recognized and appears to behave normally except that there is absolutely no audio output, there can be problems in the audio-decoding LSI chips. Other than hoping for an obvious bad connection, this is way beyond the scope of anything you can hope to repair without the service manual, test equipment, and a miracle.

Problems in the analog sections—D/A(s), sample-and-hold(s), post analog

filters, and muting relays—produce effects that are more familiar: noise, a decrease in signal strength, and distortion. Except for parts of the D/A, which may be shared, there will be identical left and right channels to compare if an audio problem develops.

Note that if only one channel is affected, then the problem most likely has nothing to do with tracking, the laser, or the mechanism. Coming off of the disc, the left and right channels are interleaved on a sample (16 bit word) basis so any disc or pickup problem would equally impact both L and R.

That means that you are left with the D/A(s), sample-and-hold(s), the filters, and the muting circuitry as your most likely culprits. Many CD players multiplex the D/A between L and R, so in these, even the D/A is ruled out since most of its circuitry is common.

Now, how do you go about tracking down the source of your problem? Swapping components one at a time between the identical left and right channels is a valid diagnostic technique. Here are some other notes and suggestions:

Players without digital filters (or oversampling) have fairly complex analog filters after the D/A. A bad or noisy component could conceivably be your problem. Even players with fancy oversampling have some kind of a final analog (anti-aliasing) filter. On an older player, there is probably a lot of discrete circuitry in the audio section.

If you can get to the components in the analog filter (some are potted), then, with a test CD that has a “silence track” and a scope or signal tracer, you should be able to find out where the noise is being introduced. If the player has separate D/As, then one of those would also be suspect.

There might be separate power supply outputs for the audio section (this will be more likely with fancy expensive players). In this case, a failure of one of the supply outputs could result in either distorted audio or no sound at all.

The following will mostly result in static type noise, hum, or erratic audio (sound not coming on or partial or total dropout for one or both channels):

Don't overlook the simple problems of dirty contacts on the RCA jacks or bad connections where they are soldered to the main circuit board. Test by jiggling the cable connectors and/or prodding the circuit board near the RCA jacks. The cable may be bad (from flex-

ing) as well—try another one.

Check the connections and controls on your amplifier and other audio components as well! Any bad connection in the audio path can lead to audio signal-chain symptoms. Clean, repair, or replace, as appropriate. Perhaps your poor, helpless CD player isn't even at fault!

Dirty muting-relay contacts could result in intermittent or noisy output. If tapping the relay affects the symptoms, this is likely the problem.

To test, remove the relay and bypass the suspect contacts with jumper wires. CAUTION: Turn your amplifier's volume control down when you start to play a disc—there may be unusual loud noises during startup that are no longer being blocked by the muting circuitry. If CDs now play without any audio problems, a bad relay is confirmed.

If that is the case, it may be possible to snap off the relay cover(s) and renew the relay(s) with contact cleaner and a burnishing tool or a strip of paper. Otherwise, replacement will be required.

## Wrap-Up

That's it for now. Next time we will get into what the CD player does when you insert a disc—and what can go wrong. In the meantime, if you have any specific problems or questions, you can reach me by e-mail at [sam@stdavids.picker.com](mailto:sam@stdavids.picker.com). For general information on electronics troubleshooting and repair, visit my site <http://www.repairfaq.org/>, or go directly to the new, expanded, and glorious FAQs at: [http://www.repairfaq.org/REPAIR/F\\_Repair.html](http://www.repairfaq.org/REPAIR/F_Repair.html). EN

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